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FROM: Woody Myers - WCR

SUBJECT: Joint Water Quality Commission - Land Disposal System Evaluation Report,
WPDES Permit # WI-0063797**Effluent & Groundwater Evaluation Summary****Table 1 Effluent Parameters and Limits**

Parameter	Current Permit WI-0063797-02		Proposed Permit WI-0063797-03	
	Limits and Units	Limit Type	Limits and Units	Limit Type
Flow Rate	- MGD		- MGD	
BOD ₅	50 mg/l	Monthly Avg	50 mg/l	Monthly Avg
Total Suspended Solids	- mg/l		- mg/l	
pH, Field	- su		- su	
Kjeldahl Nitrogen	- mg/l		- mg/l	
Ammonia	- mg/l		- mg/l	
Organic Nitrogen	- mg/l		- mg/l	
Nitrite + Nitrate as N	- mg/l		- mg/l	
Total Nitrogen	10 mg/l	Monthly Avg	10 mg/l	Monthly Avg
Total Dissolved Solids	500 mg/l	Daily Max	500 mg/l	Daily Max
Chloride	250 mg/l	Daily Max	250 mg/l	Daily Max

No recommended changes from previous permit

The effluent parameters and limits are recommended based on the need to evaluate the land treatment system. They should be incorporated into the needs of the compliance staff and not in place of their needs.

Table 2 Monitoring Wells

Well	Current Permit WI-0063797-02		Proposed Permit WI-0063797-03	
	Well Location	Well Designation	Well Location	Well Designation
801 MW-1	Down-gradient	Non-Point of Standard	Down-gradient	*Point of Standard
802 MW-2	Down-gradient	Point of Standard	Down-gradient	Point of Standard
803 MW-3	Up-gradient	Background	Up-gradient	Background
804 MW-4	Down-gradient	Non-Point of Standard	Down-gradient	Non-Point of Standard

* Recommended change from previous permit

Table 3 Groundwater Standards

Parameter	Current Permit WI-0063797-02		Proposed WI-0063797-03	
	PAL	ES	PAL	ES
Depth to Groundwater	N/A	N/A	N/A	N/A
Groundwater Elevation	N/A	N/A	N/A	N/A
Nitrogen, Nitrite + Nitrate	2.0 mg/l	10.0 mg/l	2.0 mg/l	10.0 mg/l
Chloride	125 mg/l	250 mg/l	125 mg/l	250 mg/l
pH	6.7-8.7 su	N/A	*6.6-8.6 su	N/A
Nitrogen Total Kjeldahl	N/A	N/A	N/A	N/A
Nitrogen, Ammonia	0.97 mg/l	9.7 mg/l	0.97 mg/l	9.7 mg/l
Nitrogen, Organic	2.3 mg/l	N/A	2.3 mg/l	N/A
Total Dissolved Solids	254 mg/l	N/A	*250 mg/l	N/A
Alkalinity (CaCO ₃)	N/A	N/A	* Discontinue	
Hardness (CaCO ₃)	N/A	N/A	* Discontinue	

* Recommended change from previous permit

Site Information

The Joint Water Quality Commission is a municipal wastewater treatment facility located off Lake 26 Road, Danbury, Burnett County. Wastewater is currently treated via sequency batch reactor and discharged to groundwater via absorption ponds (seepage cells) located in the SE ¼ of the SE ¼ of Section 22, T41N, R16W, Town of Swiss.

Geology

The bedrock under this facility is the Chengwatana upper volcanic sequence. It consists of basalt flows with minor inter bedded sedimentary rocks. (*Bedrock Geologic Map of Wisconsin*, Wisconsin Geological and Natural History Survey (WGNHS), 1982). Bedrock is anticipated to be between 100 and 200 feet below ground surface (bgs) (*Depth to Bedrock in Wisconsin*, WGNHS, 1973). The regolith consists of fine to coarse sand. Surface soil primarily consists of the Grayling sand (USDA Web Soil Survey).

Hydrogeology

Calculated groundwater elevation ranges between 915 and 927 feet above mean sea level (msl). Depth to groundwater was reported to be between 15 and 23 feet bgs. Groundwater flow direction was calculated to be consistently to the west-northwest. Regional groundwater is to the northwest in this area of Burnett County (*Generalized Water-Table Elevation Map of Burnett County, Wisconsin*, WGNHS, 1998). The site is approximately 1,500 feet west of the Saint Croix River.

A review of known wells was performed as a part of this evaluation. These wells include municipal, other than municipal, private and high-capacity wells. There are three private wells within a 1,500-foot range of this facility's groundwater discharge.

Hydraulic and Nitrogen Loading Rates

There are two active outfalls at this facility. Outfall 001 is the discharge associated with the groundwater monitoring network.

Table 4 Sampling Points/Outfalls

Sampling Point (Outfall) Listed in SWAMP		
Number	Outfall Type	Description
Outfall 001	Land Disposal	Effluent to absorption ponds
Outfall 002	Municipal Sludge	Reed bed cake

The following table is the average flow (hydraulic loading), total nitrogen and chloride loading summations for the Land Treatment System.

Table 5 Land Treatment Disposal Loading Averages

Year	Flow (MGD)	Nitrogen (mg/l)	Chloride (mg/l)
2021*	0.020	3.6	129
2020	0.018	7.0	143
2019	0.024	11.8	149
2018	0.022	4.3	118
2017	0.025	10.3	123
2016	0.029	5.4	142

* Indicates partial year

Groundwater Monitoring Network and Frequency (Previous Permit)

Groundwater samples were to be collected quarterly from all four wells. Well 803 is a background well and was used to calculate Preventative Action Limits (PAL) and Alternate Concentration Limits (ACL) for the previous permit term. Well 802 was designated and sampled as "Point of Standard Application" well.

Table 6 Groundwater Monitoring Well Data

Sample Point	Well Name	Elevation (feet above msl)					Well Type
		Casing Top	Ground Surface	Screen Top	Screen Bottom	Screen Length	
801	MW-1	944.46	941.8	928.3	918.3	10.0	WT
802	MW-2	940.61	938.0	925.5	915.5	10.0	WT
803	MW-3	959.69	957.2	938.7	928.7	10.0	WT
804	MW-4	940.09	937.6	919.1	909.1	10.0	WT

All measurements in feet

WT-Water table Observation P-Piezometer O-Other

The groundwater samples are analyzed for the following parameters: Nitrite + Nitrate, Chloride, Total Kjeldahl Nitrogen, Ammonia, Organic Nitrogen, pH, Total Dissolved Solids (TDS), alkalinity and hardness. All of these parameters are analyzed for the aqueous or dissolved phase in groundwater. Established groundwater quality standards are found in s. NR140.10 Table 1 Public Health Groundwater Quality Standards, and NR140.12 Table 2 Public Welfare Groundwater Standards. The thresholds of these standards are the Enforcement Standard (ES) and the PAL.

Groundwater Conditions and Exceedances

Groundwater sampling results from this facility have been analyzed for each well to evaluate trends of regulated compounds in groundwater and to calculate PALs and ACLs where appropriate. The groundwater was evaluated by looking at approximately five years of monitoring results. PALs and ACLs are calculated from this time range.

The groundwater showed frequent exceedances of chloride, nitrite + nitrate and TDS in the groundwater. There were also infrequent exceedances of ammonia in well 801.

The monitored groundwater exceedances trend summary is as follows:

MW-1 (801)

Chloride

0 of 23 samples exceeded the ES

7 of 23 samples exceeded the PAL

maximum: 155 mg/l minimum: 31 mg/l average: 98 mg/l

Nitrogen, Nitrite + Nitrate

0 of 23 samples exceeded the ES

21 of 23 samples exceeded the PAL

maximum: 5.8 mg/l minimum: 0.3 mg/l average: 3.3 mg/l

Ammonia

0 of 22 samples exceeded the ES

2 of 22 samples exceeded the PAL

maximum: 1.4 mg/l minimum: 0.05 mg/l average: 0.21 mg/l

TDS

19 of 23 samples exceeded the PAL

maximum: 456 mg/l minimum: 182 mg/l average: 340 mg/l

MW-2 (802)

Chloride

0 of 23 samples exceeded the ES

8 of 22 samples exceeded the PAL

maximum: 216 mg/l minimum: 10 mg/l average: 113 mg/l

Nitrogen, Nitrite + Nitrate

1 of 23 samples exceeded the ES

19 of 23 samples exceeded the PAL

maximum: 18.1 mg/l minimum: 0.2 mg/l average: 4.9 mg/l

TDS

20 of 23 samples exceeded the PAL

maximum: 543 mg/l minimum: 18 mg/l average: 356 mg/l

MW-4(804)

Nitrogen, Nitrite + Nitrate

0 of 22 samples exceeded the ES

1 of 22 samples exceeded the PAL

maximum: 2.2 mg/l minimum: 0.3 mg/l average: 1.0 mg/l

Concentrations and trends in the groundwater monitoring data were compared to the loading data for the land treatment system. No correlation was observed.

The chloride exceedances of groundwater quality standards were observed in well 801 and 802. These exceedances did not achieve or exceed the ES. However, the groundwater monitoring results were graphed, and a “best-fit” trend line was assigned. See Figure 1. The slope intercept for the trend line is shallow and has a positive slope for both wells 801 and 802. This means the concentration is increasing over time.

The nitrite + nitrate concentrations were graphed (see Figure 2). The concentrations are somewhat stable, but the values regularly exceed the PAL.

TDS is an indicator parameter and is commonly seen at elevated levels when the groundwater has high levels of chloride.

Proposed Groundwater Monitoring Requirements

The groundwater monitoring wells 801, 802, 803 and 804 should be sampled quarterly for the parameters in the table below. Groundwater limits for the next permit were calculated using well 803. Wells 801 and 802 are designated and should be sampled as ch. NR140.22 Wis. Admin. Code Point of Standard Application well.

Table 7 Well Sampling Recommendations

Well Name	Sample Point	Sample Frequency	Sample Parameters	Well Designation
801	MW-1	Quarterly	Table 8	*Point of Standard
802	MW-2	Quarterly	Table 8	Point of Standard
803	MW-3	Quarterly	Table 8	Background
804	MW-4	Quarterly	Table 8	Point of Standard

* Recommended change from previous permit

Table 8 Proposed Groundwater Standards –Permit WI-0063797-03

Parameter	PAL	ES	Source
Depth to Groundwater	N/A	N/A	Measured
Groundwater Elevation	N/A	N/A	Measured
Nitrogen, Nitrite + Nitrate	2.0 mg/l	10.0 mg/l	Table 1, NR140
Chloride	125 mg/l	250 mg/l	Table 2, NR 140
pH	*6.6-8.6 su	N/A	Calculated
Nitrogen, Total Kjeldahl	N/A	N/A	Measured
Nitrogen, Ammonia	0.97 mg/l	9.7 mg/l	Table 1, NR 140
Nitrogen, Organic	2.3 mg/l	N/A	Calculated
Total Dissolved Solids	* 250 mg/l	N/A	Calculated

* Recommended change from previous permit

Well 801 is down-gradient of the absorption ponds and greater than 250 feet so it has been redesignated as a point of standards application well per ch. NR 140.22 Wis. Adm. Code. Due to background groundwater quality the PAL for pH has been reduced. The PAL for TDS was increased to be consistent with PAL rounding protocols.

Conclusions

Based on the groundwater flow direction the monitoring wells are in adequate locations to determine compliance with groundwater quality standards.

It is recommended that the sampling for alkalinity and hardness be suspended.

Well 801 has been redesignated as a point of standards application well due to its distance from the absorption ponds.

The PAL for pH was reduced based on background groundwater quality from the previous permit term and the PAL for TDS has been raised slightly to remain consistent with rounding protocols for PALs.

Both chloride and nitrite + nitrate frequently exceeded the chs. NR 140.10 Table 1 and NR 140.12 Table 2 groundwater quality standards in wells 801 and 802. Because these wells are point of standards application wells a response action is required by the department. Two schedules are recommended as these response actions.

Chloride does not break down in groundwater, therefore the only action a facility can take is to take reduction measures to reduce the levels in the influent.

Per the Compliance Engineer the facility cleaned the sequency batch reactor and diffusers (completed 11/2020). This action is seen as a ch. NR140.24 response action for the nitrite + nitrate exceedances in groundwater. Additional actions can be taken by the optimization of the absorption ponds operation, one area to do this is by adjusting the load rest cycles.

Overall, the facility is found to be substantially compliant.

Schedule Recommendations

A chloride source reduction schedule maybe warranted. This would be considered the facility's ch. NR 140.24 response action.

Optimization of the load-rest cycles for the absorption ponds should be considered.

Figure 1
Chloride

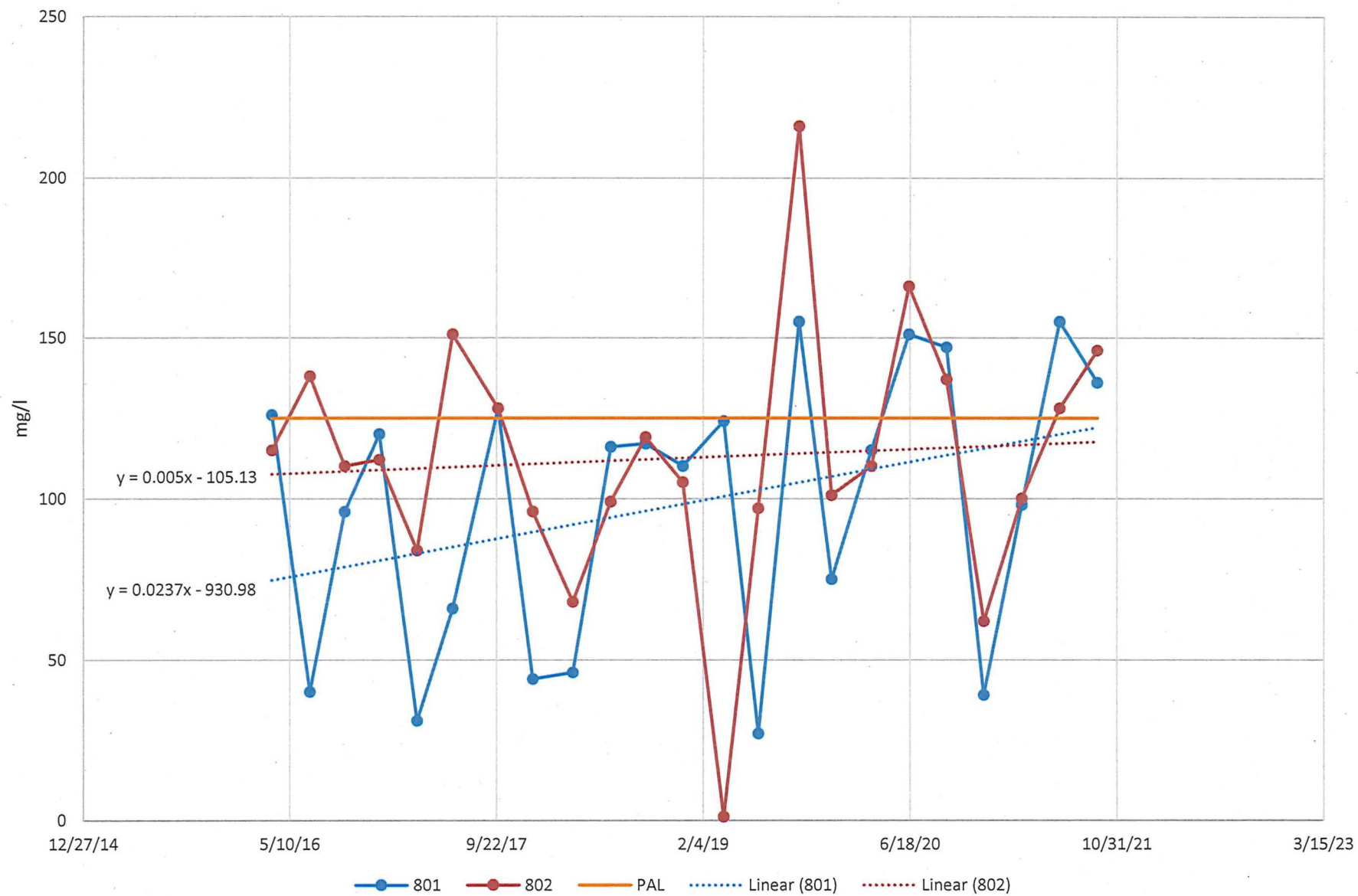


Figure 2
NO₂ + NO₃

